Igor Kozin - DTU Orbit (09/11/2017)
Igor Kozin

Organisations

Senior Researcher, Department of Management Engineering
24/01/2008 → present
igko@dtu.dk
VIP

Engineering Systems
03/06/2016 → present
VIP

Risø National Laboratory for Sustainable Energy
11/01/2007 → 07/04/2016 Former
igko@risoe.dtu.dk
VIP

Production and Service Management
05/06/2012 → 20/05/2016 Former
VIP

Transport DTU
16/03/2017 → 25/04/2017 Former
VIP

Engineering Systems Group
17/03/2015 → 03/06/2016 Former
VIP

Risk Research Group
11/09/2014 → 03/06/2016 Former
VIP

Publications:

Computing interval-valued reliability measures: application of optimal control methods
The paper describes an approach to deriving interval-valued reliability measures given partial statistical information on the occurrence of failures. We apply methods of optimal control theory, in particular, Pontryagin’s principle of maximum to solve the non-linear optimisation problem and derive the probabilistic interval-valued quantities of interest. It is proven that the optimisation problem can be translated into another problem statement that can be solved on the class of piecewise continuous probability density functions (pdfs). This class often consists of piecewise exponential pdfs which appear as soon as among the constraints there are bounds on a failure rate of a component under consideration. Finding the number of switching points of the piecewise continuous pdfs and their values becomes the focus of the approach described in the paper. Examples are provided.

General information
State: Published
Organisations: Department of Management Engineering, Engineering Systems, Ufa State Academy of Economics and Service
Authors: Kozin, I. (Intern), Krymsky, V. (Ekstern)
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Journal: International Journal of General Systems
Volume: 46
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ISSN (Print): 0308-1079
Ratings:
BFI (2017): BFI-level 1
Risk Management Challenges in Large-scale Energy PSS

Probabilistic risk management approaches have a long tradition in engineering. A large variety of tools and techniques based on the probabilistic view of risk is available and applied in PSS practice. However, uncertainties that arise due to lack of knowledge and information are still missing adequate representations. We focus on a large-scale energy company in Denmark as one case of current product/servicesystems risk management best practices. We analyze their risk management process and investigate the tools they use in order to support decision making processes within the company. First, we identify the following challenges in the current risk management practices that are in line with literature: (1) current methods are not appropriate for the situations dominated by weak knowledge and information; (2) quality of traditional models in such situations is open to debate; (3) quality of input data and representation of the results to the decision makers play an important role. Second, we introduce a selection of alternative, so-called “post-probabilistic”, risk management methods developed across different scientific fields to cope with uncertainty due to lack of knowledge. Possibilities for overcoming industrial PSS risk management challenges are
suggested through application of post-probabilistic methods. We conclude with the discussion on the importance for the field to consider their application.

**General information**
State: Published
Organisations: Department of Management Engineering, Engineering Systems
Authors: Tegeltija, M. (Intern), Oehmen, J. (Intern), Kozin, I. (Intern)
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Product-service system, Risk Management, Uncertainty, Risk management tools, Probabilistic challenges
Electronic versions:
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Source-ID: 132819328
Publication: Research - peer-review › Article in proceedings – Annual report year: 2017

**Safe manning of merchant ships: an approach and computer tool**
In the shipping industry, staffing expenses have become a vital competition parameter. In this paper, an approach and a software tool are presented to support decisions on the staffing of merchant ships. The tool is implemented in the form of a Web user interface that makes use of discrete-event simulation and allows estimation of the workload and of whether different scenarios are successfully performed taking account of the number of crewmembers, watch schedules, distribution of competencies, and others. The software library ‘SimManning’ at the core of the project is provided as open source. The tool is conceived as a support for the maritime authorities, certifying bodies and shipping companies to assess whether a ship is safely manned.

**General information**
State: Published
Organisations: Department of Management Engineering, Engineering Systems
Authors: Alapetite, A. (Intern), Kozin, I. (Intern)
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Main Research Area: Technical/natural sciences

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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.518 SNIP 1.482 CiteScore 1.59
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.302 SNIP 1.441 CiteScore 1.77
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.987 SNIP 1.524 CiteScore 1.96
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Organisations: Department of Management Engineering, Engineering Systems, Transport DTU
Authors: Tegeltija, M. (Intern), Kozin, I. (Intern)
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Main Research Area: Technical/natural sciences
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Links:
http://gri.gu.se/konferens/sra-nordic-chapter-meeting
Source: PublicationPreSubmission
Source-ID: 128903948
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

Project risk management: potential in the field and the NUSAP scheme

Afværgeforanstaltninger og monitorering

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Production and Service Management, Department of Management Engineering, Engineering Systems
Authors: Hansen, S. F. (Intern), Kozin, I. (Intern)
Pages: 25-30
Publication date: 2016
Emergency Management involving Critical Infrastructure Disruptions: operationalizing the deployment of resilience capabilities

Recent developments nurturing the importance of Emergency Management (EM) of Critical Infrastructure (CI) brought a shift of emphasis from protecting the systems to building resilience. Resilience approach is required to cope with inevitable events, ensuring ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event. The study proposes a novel approach to integrating the resilience capacities of CI into the EM cycle, which facilitates emergency services and CI operators to collaborate in addressing resilience improvement measures, while planning to cope with CI disruptions. It grounds on a previously published comprehensive framework which reflects the main characteristics of such emergencies (e.g. interdependent, multi-sectoral, multi-stakeholder) and supports the identification, assessment and development of specific technical and organizational capabilities. A pilot application is provided on a real case involving the public and private actors engaged in the Regional Programme on Critical Infrastructure Protection and Resilience (CIP-R) in Lombardy (Italy).

Identification of risks stemming from new communication technologies

Advanced distributed communication technologies play an important role today in the control and maintenance of safety-critical systems. However, the excessively optimistic reliance on the new technology without recognizing the threats against its successful functioning, being able to maintain barriers or/and eliminate or reduce the risks may result in impairments compromising the opportunities. At the current state of knowledge it is even unclear whether we can develop trustful causal paths between hazards of different natures and their consequences. Hazard identification and risk analysis have proved to be effective tools in developing more reliable and robust systems. As technology is developing fast though, a new need for an effective hazard identification methodology has emerged. To enhance the predictive performance of hazard identification in advanced distributed communication systems, we have envisioned and currently developing a multilevel-multidimensional HAZOP methodology. The methodology introduces a new creative thinking stimulation model to substitute the conventional guideword-based approaches that is based on a multiple level and dimension exploration of the system under consideration. This paper describes the work carried out to extend the standard HAZOP approaches to suit the analysis of new communication technologies based on a simple corrective maintenance scenario taking place at a Nuclear Power Plant.
Operational implications of accepting and denying whether a true value of risk exists

It is suggested to look on probabilistic risk quantities and concepts through the prism of accepting one of the views: whether a true value of risk exists or not. It will be argued that discussions until now have been primarily focused on closely related topics that are different from the suggested one.

In general, the values of risks are not known precisely and the analyst has the option to consider that convergence to a precise value of risk is possible in the limit. That is, the true value exists but due to limited time, resources or other limitations in assessing probabilities it is not known at the time being. Following this prospective, a single probability distribution over a set of possible outcomes can be chosen that is tacitly regarded as a ‘true’ or ‘ideal’ model of uncertainty. After that, computing other probabilistic risk measures of interest becomes a rather easy mathematical exercise. In fact, accepting the true-value view does not make the adherent use only a single probability distribution as a model of uncertainty. One can introduce a class of distributions in which a particular member is considered a plausible candidate to be an ideal distribution. Then, a risk quantity of interest can be computed for each distribution-candidate and after that, lower and upper bounds can be constructed as assessments of risk. This is a robust way of compensating for ignorance that studies the sensitivity of derived numerical values to variations in probability distributions.

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Organisations: Department of Management Engineering, Engineering Systems
Authors: Kozin, I. (Intern)
Publication date: 2016
Event: Abstract from SRA Europe 2nd Nordic Chapter Meeting, Gothenburg, Sweden.
Main Research Area: Technical/natural sciences
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Source: PublicationPreSubmission
Source-ID: 127616073
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Overordnet beskrivelse /screening af risici og farer ved indvinding af skifergas

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State: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Production and Service Management , Department of Management Engineering, Engineering Systems
Authors: Hansen, S. F. (Intern), Kozin, I. (Intern)
Pages: 13-25
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Title of host publication: Videnskabelig udredning af international viden om skifergas relateret til en dansk kontekst : DTU, GEUS, DCE
Publisher: Aarhus Universitet, GEUS og Danmarks Tekniske Universitet
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Main Research Area: Technical/natural sciences
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Publication: Commissioned › Report chapter – Annual report year: 2016

Post-Probabilistic Uncertainty Quantification: Discussion of Potential Use in Product Development Risk Management
Uncertainty represents one of the key challenges in product development (PD) projects and can significantly impact a PD project's performance. Risks in PD lead to schedule and cost over-runs and poor product quality [Ölechowski et al. 2012]. Risk management is one response for the identification and management of risks. Acknowledging the increasing societal and business criticality of product development projects, there is a need to more thoroughly explore the various fundamental approaches to describe and quantify various types of uncertainty as part of the overall decision making process. Decisions made by PD managers and engineers have a significant impact on the strategic value of the asset delivered, and these decisions depend on the quality of information on which they are based [Eweje et al. 2012].
Uncertainty plays an important role in decision making. Decision making quality improves if uncertainty is carefully addressed (e.g. [Prelec and Loewenstein 1991], [Riabacke 2006]). In the risk management community there is a strong argument that at least two distinct types of uncertainty have to be taken into account: aleatory and epistemic. Epistemic uncertainty arises due to lack of knowledge and can be reduced by collecting and acquiring new knowledge. This is in contrast to aleatory uncertainty that is of stochastic nature, and therefore cannot be reduced, but can be well modelled and described by probability distributions. In addition to uncertainty, ambiguity needs to be considered that addresses the different ways in which factual statements may be interpreted by different individuals [Klinke and Renn 2002].[Flyvbjerg 2007] observed that the main challenges of large projects, including PD projects, are inadequate, unreliable or misleading information; and conflicts between decision making, policy and planning. It has been proven by empirical studies (e.g. [Levi 1990], [Sahlin 2012]) that the amount and quality of information behind probabilities and utilities is an important factor when making decisions, in other words, people tend to make different decisions if they are aware of the amount and quality of the data on which probability and utility assessments are based. Arguably, the key challenge in PD risk management today is that uncertainty quantification relies solely (or at least heavily) on probabilistic models. While these are appropriate to describe aleatory uncertainty, they are fundamentally ill-suited to model epistemic uncertainty. In this paper, we will explore novel post-probabilistic uncertainty quantification models that promise to better address epistemic uncertainty, and their possible application in the context of PD risk management.

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Organisations: Department of Management Engineering, Engineering Systems
Authors: Tegeltija, M. (Intern), Oehmen, J. (Intern), Kozin, I. (Intern), Geraldi, J. (Intern)
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Conference: 14th International Design Conference, Dubrovnik, Croatia, 16/05/2016 - 16/05/2016
Risk management, Post-probabilistic methods, Uncertainty
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

**Prediction of Repair Work Duration for Gas Transport Systems Based on Small Data Samples**
Prediction of the duration of a repair and maintenance project of a gas transport system is an important part of planning activities. There exist numerous sources of uncertainties that may result in time overruns possibly leading to multiple negative consequences. Our experience in planning this work suggests that accepting the stochastic nature of the project duration is a constructive step towards the preparedness to contingencies and defining penalties for repair companies. To support this approach, one needs to construct probability distributions of the durations of the projects. To address the issue of the scarcity of observed data, we suggest using a bootstrap resampling procedure. Gram-Charlier functions and order statistics are employed to approximate the distributions. It is demonstrated how to derive them for a separate repair project and a larger project consisting of a number of concurrently running subprojects. Following this, guidance is provided on how to decide about what duration should define the deadline for completion of the whole work. A simple example is provided.

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State: Published
Organisations: Department of Management Engineering, Engineering Systems, Science Research Institute of Economics and Management in Gas Industry
Authors: Lesnykh, V. (Ekstern), Litvin, Y. (Ekstern), Kozin, I. (Intern)
Pages: 305-320
Publication date: 2016
Main Research Area: Technical/natural sciences

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Scopus rating (2016): SJR 0.383 SNIP 0.564 CiteScore 0.49
BFI (2015): BFI-level 1
Process Risk Assessment using Dynamic Simulation of Scenarios

Process plants may be very complex and may combine various processes in close proximity. Hence, the response to accidents may easily grow complex. Traditionally, after gathering and getting acquainted with the plant's technical information, risk is analysed in prescribed steps starting with hazard identification, description of accident scenarios and using the conventional approach to develop static event trees for events following a loss of containment. Modelling the impacts and consequences needs models to describe the release, dispersion and effect of the hazardous material, as well as models for predicting the egress time of people, response times of detectors and other safety equipment. A common assumption is the independence of these models and their sequential treatment, but often the consequences and effects are mutually dependent. The prediction of the consequences and effects are deterministic assignments applying simplified engineering models with averaged/expected values as input to account for the characteristics of the system, e.g. describing the physical and environmental phenomena and workers responses. The size of the release and dispersion depends on technical and environmental parameters. Ignition sources may be permanent or temporarily present at various locations near the release. The response times of detectors may be dependent on the velocity of cloud spread. The available safe egression time depends on these parameters. Such dynamics are easily modelled using Discrete Event Simulation (DES) of the scenarios, which is a Monte Carlo type method.

The paper describes the application of DES to conduct the analysis part of a risk assessment that enables better time resolution in the modelling of the specific scenarios, simulate the interactions between concurrent chains of events under the hazardous scenarios, and produce probabilistic risk measures. The outcome provides possibilities to structure the results in a comprehensive way. Scenarios with severe consequences can be ‘played back’ to learn from them and can be animated, which apart from the learning effect provides a new way of validation.

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group, Implementation and Performance Management, Engineering Systems, Engineering Systems Group
Authors: Markert, F. (Intern), Kozin, I. (Intern), Duijm, N. J. (Intern)
Number of pages: 6
Pages: 181-186
Publication date: 2016
Building Critical Infrastructure resilience capacities into the Emergency Management set-up: a reference framework

Improving the resilience capacities required to manage Critical Infrastructure (CI) disruptions includes also enhancement of current Emergency Management practices. Our approach aims to integrate CI-specific issues into the EM setup (prevention, mitigation, response, and recovery). This paper proposes a comprehensive framework to identify, build and enhance specific capabilities, both intra- and inter-organisational, needed to manage (prepare, cope and recover from) CI disruptions. This allows emergency services to assess and explicitly address resilience improvement measures while planning to cope with CI disruptions. To operationalise this approach we have developed a hierarchical taxonomy that classifies system resilience capabilities at both technological and organisational level in each single organisation (CI operator or responder). Capabilities are defined as a combination of assets, resources and processes specifically arranged to accomplish a critical task and assure a key objective. Each capability contributes to one or more resilience capacities (preventive, absorptive, adaptive and restorative). An overall resilience capability building cycle completes the framework, enabling a systematic implementation of relevant capabilities and making gap analysis with regard to resilience deficits. The planning of training exercises to enhance CI resilience can also benefit from the approach.
Creating Resilience Capability against Critical Infrastructure Disruptions: Foundations, Practices and Challenges

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Engineering Systems Group, Risk Research Group
Authors: Kozine, I. (Intern)
Number of pages: 17
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Source: PublicationPreSubmission
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Publication: Research › Sound/Visual production (digital) – Annual report year: 2015

Dynamic versus static modelling of safety-critical systems for risk assessment

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group, Engineering Systems Group
Authors: Markert, F. (Intern), Kozine, I. (Intern)
Number of pages: 28
Publication date: 2015

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Original language: English
Main Research Area: Technical/natural sciences
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Integration of resilience capabilities for Critical Infrastructures into the Emergency Management set-up

We suggest an approach for maintaining and enhancing resilience that integrates the resilience capabilities of Critical Infrastructures (CIs) into the emergency management cycle (prevention, preparedness, response, and recovery). This allows emergency services to explicitly address resilience improvement measures while planning to cope with CI disruptions. To operationalise this approach we have developed a hierarchical taxonomy that classifies system resilience capabilities into intra- and interorganisational categories. Capabilities are defined as a combination of assets, resources and processes specifically arranged to accomplish a critical task and assure a key objective. They are grouped into preventive, absorptive, adaptive and restorative sets. The capabilities are identified at both the technological and the organisational level in each organisation (CI operator or responder). An overall resilience capability building cycle completes the framework, enabling a systematic implementation of relevant capabilities and making gap analysis with
regard to resilience deficits. The planning of training exercises to enhance CI resilience can also benefit from the approach.

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Engineering Systems Group, Risk Research Group, Technology and Innovation Management
Authors: Kozine, I. (Intern), Andersen, H. B. (Intern)
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Publisher: C R C Press LLC
Editors: Podofillini, L., Sudret, B., Stojadinovic, B., Zio, E., Kröger, W.
ISBN (Print): 978-1-138-02879-1
BFI conference series: European Safety and Reliability conference (5010077)
Main Research Area: Technical/natural sciences
Conference: European Safety and Reliability Conference 2015, Zürich, Switzerland, 07/09/2015 - 07/09/2015
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Unforeseen Accidents: Improving Risk Management Practices and Predictability

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Authors: Taylor, R. (Ekstern), Kozine, I. (Intern)
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Publication date: 2015

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Publisher: Nordic Chapter of SRA Europe
Main Research Area: Technical/natural sciences
Electronic versions:
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Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2015

A novel risk assessment method using dynamic simulation of fire and egress scenarios on off-shore platforms

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group
Authors: Markert, F. (Intern), Duijm, N. J. (Intern), Kozine, I. (Intern)
Number of pages: 1
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Main Research Area: Technical/natural sciences
Electronic versions:
A_novel_risk_assessment.pdf
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2014
A novel risk assessment method using dynamic simulation of fire and egress scenarios on off-shore platforms

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Authors: Markert, F. (Intern), Duijm, N. J. (Intern), Kozine, I. (Intern)
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Original language: English
Main Research Area: Technical/natural sciences
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Publication: Research › Sound/Visual production (digital) – Annual report year: 2014

Cognitive modelling of train drivers for improving safety

General information
State: Published
Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group
Authors: Kozine, I. (Intern), Duijm, N. J. (Intern), Thommesen, J. (Intern)
Number of pages: 1
Publication date: 2014
Main Research Area: Technical/natural sciences
Publication: Research › peer-review › Conference abstract for conference – Annual report year: 2015

Epistemic risks: challenges in assessment and decision making
The wide acceptance of risk analysis methods and their application may give the impression that the field is mature and that a change of approach is not needed. Nevertheless, the recent trends of debates in the risk community indicate that the basics of risk management become questioned. There are calls to revisions ranging from the definition of risk and stretching to the use of risk analysis results in decision making.

The talk will centre in answering the following questions: Why conventional approach to risk analysis is challenged? What are alternatives? How to operationalise the inclusion of epistemic uncertainty in risk analysis? How to make decisions based on risk analysis results?

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Authors: Kozine, I. (Intern)
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Publication: Research › Conference abstract for conference – Annual report year: 2015

Is the ALARP principle rational?

General information
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Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group
Authors: Kozine, I. (Intern)
Number of pages: 1
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Publisher: Society for Risk Analysis
Main Research Area: Technical/natural sciences
Conference: 23rd SRA-E Conference, Istanbul, Turkey, 16/06/2014 - 16/06/2014
Offshore Platform Hydrocarbon Risk Assessment – OPHRA: Feasibility

This report describes the feasibility demonstration of a new method to perform risk assessments for offshore platforms. This method simulates the following phenomena as concurrent sequences of events using the Arena® Discrete Event Simulation (DES) software (version 14.50.00):

- Release, ignition and fire;
- Detection, shut down and alarm;
- Escape and evacuation;
- Exposure and impact on people and equipment

This method leads to a transparent framework for modelling, which helps to demonstrate the correctness and appropriateness of models and assumptions.

The report lists the (type of) models and data needed for the risk assessment framework, and provides specific suggestions for some of those models.

Some preliminary calculations with the DES model have been performed to illustrate type of results that can be obtained and to provide some insight in the accuracy and computational efforts.

Finally, further work is identified in order to develop an operational risk assessment tool.

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State: Published
Organisations: Department of Management Engineering, Production and Service Management, Risk Research Group
Authors: Duijm, N. J. (Intern), Kozine, I. (Intern), Markert, F. (Intern)
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Information about robustness, reliability and safety in early design phases

This thesis is motivated by the need for support in considerations of robustness, reliability and safety during early design phases. The thesis deals with the question of how to codify and communicate failures and hazards, and devises measures against these. Current methods to robustness, reliability and safety reviewed have shortcomings including the complexity of using them and dependence on expert input for mitigating uncertainty and ambiguity among solution alternatives. This research is carried out using case studies: a pilot case to assess information requirements from reliability methods, and an industrial case to assess how the use of information about robustness, reliability and safety as practised by current methods influences concept development. Current methods cannot be used in early design phases due to their dependence on detailed design information for the identification of attributes of robustness, reliability and safety. A taxonomy was therefore developed to assess the information about these attributes that current methods require, and to address the need for clarity about design issues that result in risks. The concept development phase fosters ambiguity on how to satisfy requirements of robustness, reliability and safety, which is exacerbated by complexity in the individual solution alternatives. This prompts designers to reuse working principles that are inherently flawed, as they are liable to disturbances, failures and hazards. To address this issue, an approach based upon individual records of early design issues consists of comparing failures and benefits from prior working principles, before making a decision, and improving the more suitable alternatives through this feedback. Workshops were conducted with design practitioners to evaluate the potential of the approach and to simulate decision-making and gain feedback on a proof-of-concept basis. The evaluation has demonstrated that the use of individual records on failures and benefits of solution alternatives successfully averted the repeated use of flawed working principles and identified the effective design solutions of the outstanding issues.

General information
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An interval-valued reliability model with bounded failure rates

The approach to deriving interval-valued reliability measures described in this paper is distinctive from other imprecise reliability models in that it overcomes the issue of having to impose an upper bound on time to failure. It rests on the presupposition that a constant interval-valued failure rate is known possibly along with other reliability measures, precise or imprecise. The Lagrange method is used to solve the constrained optimization problem to derive new reliability measures of interest. The obtained results call for an exponential-wise approximation of failure probability density function if only partial failure information is available. An example is provided. © 2012 Copyright Taylor and Francis Group, LLC.
Risk management of complex environments needs the supportive tools provided by computer models and simulation. During time, various tools have been developed and been applied with different degree of success. The still lasting increase in computer power and the associated development potentials stimulate and promote their application within risk management. Today, computer supported models as fault trees, event trees and Bayesian networks are commonly regarded and applied as standard tools for reliability and risk practitioners. There are though some important features that hardly can be captured by the conventional reliability analysis models and systems analysis methods. An improvement and alternative to the conventional approach is seen in using Discrete Event Simulation (DES) models that can better account for the dynamic dimensions of the systems. The paper will describe the authors’ experience in applying DES models to the analysis of large infrastructures for refueling stations and water supply. Two case studies are described which are concerned with the inherently safer supply and storage of hydrogen at refueling stations and an established drinking water supply system of a large metropolitan area, respectively. For both, the simulation aims at identifying points of potential improvement from the reliability point of view. This allows setting up a list of activities and safety measures to reduce risk and possible losses and mitigate the consequences of accidents. Based on the cases presented the advantages of DES modeling over the conventional models will be exhibited and discussed.
Powering stochastic reliability models by discrete event simulation

Markov reliability models are widely practiced tools for the analysis of repairable systems. Nevertheless, the assumptions of the Markov model may appear too restrictive to adequately model a real system and the explosion in the number of states as the size of the system increases may make it difficult to find a solution to the problem. The power of modern computers and recent developments in discrete-event simulation (DES) software enable to diminish some of the drawbacks of stochastic models. In this paper we describe the insights we have gained based on using both Markov and DES models for simple systems. By contrasting the results of the two models we illuminate their advantages and disadvantages as well as we conclude that it is a good way of model validation.

Safe manning of safety-critical systems

Estimation of Uncertainty for emerging Technologies and Implications to Risk Management
**Estimation of Uncertainty in Risk Assessment of Hydrogen Applications**

Hydrogen technologies such as hydrogen fuelled vehicles and refuelling stations are being tested in practice in a number of projects (e.g. HyFleet-Cute and Whistler project) giving valuable information on the reliability and maintenance requirements. In order to establish refuelling stations the permitting authorities request qualitative and quantitative risk assessments (QRA) to show the safety and acceptability in terms of failure frequencies and respective consequences. For new technologies not all statistical data might be established or are available in good quality causing assumptions and extrapolations to be made. Therefore, the QRA results will contain varying degrees of uncertainty as some components are well established while others are not. The paper describes a methodology to evaluate the degree of uncertainty in data for hydrogen applications based on the bias concept of the total probability and the NUSAP concept to quantify uncertainties of new not fully qualified hydrogen technologies and implications to risk management.

**General information**

State: Published
Organisations: Safety, Reliability and Human Factors, Department of Management Engineering
Authors: Markert, F. (Intern), Krymsky, V. (Ekstern), Kozine, I. (Intern)
Pages: 194
Publication date: 2011

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**On Models of Apportionment of Safety Tags Accounting for Human Error, Organisational Factors and Uncertainty**

The application of imprecise reliability models is often hindered by the rapid growth in imprecision that occurs when many components constitute a system and by the fact that time to failure is bounded from above. The latter results in the necessity to explicitly introduce an upper bound on time to failure which is in reality a rather arbitrary value. The practical meaning of the models of this kind is brought to question. We suggest an approach that overcomes the issue of having to impose an upper bound on time to failure and makes the calculated lower and upper reliability measures more precise. The main assumption consists in that failure rate is bounded. Langrage method is used to solve the non-linear program. Finally, an example is provided.

**General information**

State: Published
Organisations: Safety, Reliability and Human Factors, Department of Management Engineering, Ufa State Academy of Economics and Service

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**Overcoming some limitations of imprecise reliability models**

The application of imprecise reliability models is often hindered by the rapid growth in imprecision that occurs when many components constitute a system and by the fact that time to failure is bounded from above. The latter results in the necessity to explicitly introduce an upper bound on time to failure which is in reality a rather arbitrary value. The practical meaning of the models of this kind is brought to question. We suggest an approach that overcomes the issue of having to impose an upper bound on time to failure and makes the calculated lower and upper reliability measures more precise. The main assumption consists in that failure rate is bounded. Langrange method is used to solve the non-linear program. Finally, an example is provided.
Application of safety and reliability approaches in the power sector: Inside-sectoral overview

This chapter summarizes the state-of-the-art and state-of-practice on the applications of safety and reliability approaches in the Power Sector. The nature and composition of this industrial sector including the characteristics of major hazards are summarized. The present situation with regard to a number of key technical aspects involved in the use of safety and reliability approaches in the power sector is discussed. Based on this review a Technology Maturity Matrix is synthesized. Barriers to the wider use of risk and reliability methods in the design and operation of power installations are identified and possible ways of overcoming these barriers are suggested. Key issues and priorities for research are identified.

General information
State: Published
Organisations: Safety, Reliability and Human Factors, Department of Management Engineering
Authors: Kozine, I. (Intern)
Number of pages: 459
Pages: 417-431
Publication date: 2010

Discrete event simulation versus conventional system reliability analysis approaches

Discrete Event Simulation (DES) environments are rapidly developing and appear to be promising tools for building reliability and risk analysis models of safety-critical systems and human operators. If properly developed, they are an alternative to the conventional human reliability analysis models and systems analysis methods such as fault and event trees and Bayesian networks. As one part, the paper describes briefly the author’s experience in applying DES models to the analysis of safety-critical systems in different domains. The other part of the paper is devoted to comparing conventional approaches to system reliability analysis with DES.

General information
State: Published
Organisations: Safety, Reliability and Human Factors, Department of Management Engineering
Authors: Kozine, I. (Intern)
Number of pages: 2,480
Pages: 778-784
On new cautious structural reliability models in the framework of imprecise probabilities

New imprecise structural reliability models are described in this paper. They are developed based on the imprecise Bayesian inference and are imprecise Dirichlet, imprecise negative binomial, gamma-exponential and normal models. The models are applied to computing cautious structural reliability measures when the number of events of interest or observations is very small. The main feature of the models is that prior ignorance is not modelled by a fixed single prior distribution, but by a class of priors which is defined by upper and lower probabilities that can converge as statistical data accumulate. Numerical examples illustrate some features of the proposed approach.
On New Cautious Structural Reliability Models in the Framework of imprecise Probabilities

Uncertainty of parameters in engineering design has been modeled in different frameworks such as inter-val analysis, fuzzy set and possibility theories, ran-dom set theory and imprecise probability theory. The authors of this paper for many years have been de-veloping new imprecise reliability models and gen-eralizing conventional ones to imprecise probabil-ities. The theoretical setup employed for this purpose is imprecise statistical reasoning (Walley 1991), whose general framework is provided by upper and lower previsions (expectations). The appeal of this theory is its ability to capture both aleatory (stochas-tic) and epistemic uncertainty and the flexibility with which information can be represented. The previous research of the authors related to generalizing structural reliability models to impre-cise statistical measures is summarized in Utkin & Kozine (2002) and Utkin (2004). The presupposed input for the imprecise structural reliability models was some probabilistic measures (precise or impre-cise) of strength and stress. While the accepted pre-mises are meaningful and practical in some applica-tions, they do not cover many other cases the reliability analyst faces in practice. Often the above mentioned inputs do not exist and the analyst has on-ly some judgments or measurements (observations) of values of stress and strength. How to utilize this available information for computing the structural reliability and what to do if the number of judgments or measurements is very small? Developing models enabling to answer these two questions has been in the focus of the new research the results of which are described in the paper. In this paper we describe new models for com-puting structural reliability based on measurements of values of stress and strength and taking account of the fact that the number of observations may be ra-ther small. The approach to developing the models is based on using the imprecise Bayesian inference models (Walley 1996). These models provide a rich supply of coherent imprecise inferences that are ex-pressed in terms of posterior upper and lower prob-abilities. The probabilities are initially vacuous, re-flecting prior ignorance, become more precise as the number of observations increase. The new imprecise structural reliability models are based on imprecise Bayesian inference and are imprecise Dirichlet, imprecise negative binomial, gamma-exponential and normal models. The models are applied to computing cautious structural reliabil-ity measures when the number of events of interest or observations is very small. The main feature of the models is that prior ignorance is not modeled by a fixed single prior distribution, but by a class of pri-or which is defined by upper and lower probabili-ties that can converge as statistical data accumulate. Numerical examples illustrate some features of the proposed approach.

General information
State: Published
Organisations: Department of Management Engineering, Safety, Reliability and Human Factors, Saint-Petersburg State Forest Technical Academy
Authors: Utkin, L. V. (Ekstern), Kozine, I. (Intern)
Pages: 1261-1267
Publication date: 2010

Host publication information
Title of host publication: Safety, Reliability and Risk of Structures, Infrastructures and Engineering Systems
Place of publication: London
Bounded Densities and Their Derivatives: Extension to Other Domains

This paper describes how one can compute interval-valued statistical measures given limited information about the underlying distribution. The particular focus is on a bounded derivative of a probability density function and its combination with other available statistical evidence for computing quantities of interest. To be able to utilise the evidence about the derivative it is suggested to adapt the ‘conventional’ problem statement to variational calculus and the way to do so is demonstrated. A number of examples are given throughout the paper.
Bounded Densities and Their Derivatives: Extension to Other Domains
More and more often the traditional (classical) concept of probability and the statistical methods based on it, have been criticized for being unable to cope with the multidimensional nature of uncertainty. Careful handling of imprecision is essential to draw reliable conclusions from complex data. This paper presents a short introductory discussion on the general area of imprecision in statistical theory and practice, and briefly introduces the further papers in this collection, demonstrating the importance of the adequate modelling of imprecision in different areas of application.

Computing interval-valued statistical characteristics: What is the stumbling block for reliability applications?
The application of interval-valued statistical models is often hindered by the rapid growth in imprecision that occurs when intervals are propagated through models. Is this deficiency inherent in the models? If so, what is the underlying cause of imprecision in mathematical terms? What kind of additional information can be incorporated to make the bounds tighter? The present paper gives an account of the source of this imprecision that prevents interval-valued statistical models from being widely applied. Firstly, the mathematical approach to building interval-valued models (discrete and continuous) is delineated. Secondly, a degree of imprecision is demonstrated on some simple reliability models. Thirdly, the root mathematical cause of sizeable imprecision is elucidated and, finally, a method of making the intervals tighter is described. A number of examples are given throughout the paper.
Discrete event simulation as a versatile analysis tool for safety-critical systems

General information
State: Published
Organisations: Department of Management Engineering, Safety, Reliability and Human Factors
Authors: Kozine, I. (Intern)
Number of pages: 78
Pages: 1-78
Publication date: 2009

Host publication information
Title of host publication: From the everyday to the extraordinary : SRA-Europe Conference
Place of publication: Karlstad
Publisher: Universitetsstryckeriet
Main Research Area: Technical/natural sciences
Conference: From the Everyday to the Extraordinary, Karlstad, Sweden, 28/06/2009 - 28/06/2009
Source: orbit
Source-ID: 233187
Publication: Research - peer-review › Journal article – Annual report year: 2009

Discrete event simulation in support to hydrogen supply reliability

General information
Lecture for postgraduate diploma in safe transport, storage and usage of hydrogen: Risk Assessment

General information
State: Published
Organisations: Department of Management Engineering, Safety, Reliability and Human Factors
Authors: Markert, F. (Intern), Kozine, I. (Intern), Duijm, N. J. (Intern)
Publication date: 2009

Publication information
Original language: English
Main Research Area: Technical/natural sciences
transport of hydrogen
Source: orbit
Source-ID: 254071
Publication: Education › Compendium/lecture notes – Annual report year: 2009

Risk analysis and assessment: Discrete event simulation as a versatile analysis tool for safety-critical systems

General information
State: Published
Organisations: Department of Management Engineering, Safety, Reliability and Human Factors
Authors: Kozine, I. (Intern)
Publication date: 2009
Event: Abstract from From the Everyday to the Extraordinary, Karlstad, Sweden.
Main Research Area: Technical/natural sciences
Risk analysis
Source: orbit
Source-ID: 251323
Publication: Research › Conference abstract for conference – Annual report year: 2009

Uncertainty modeling with imprecise statistical reasoning and the precautionary principle in decision making

General information
State: Published
Organisations: Safety, Reliability and Human Factors, Department of Management Engineering
Authors: Kozine, I. (Intern)
Pages: 225-238
Publication date: 2008

Host publication information
Title of host publication: Real-Time and Deliberative Decision Making
Place of publication: Berlin

Enhancement of natural extension

Simulation of human multitask performance
Simulation of human performance in time-pressured scenarios

State: Published
Organisations: Safety, Reliability and Human Factors, Systems Analysis Division, Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 141-151
Publication date: 2007
Main Research Area: Technical/natural sciences

Volume: 221
ISSN (Print): 1748-006X
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.528 SNIP 0.855 CiteScore 1.04
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.624 SNIP 1.009 CiteScore 1.36
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.542 SNIP 0.723 CiteScore 1.08
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.55 SNIP 1.226 CiteScore 1.16
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.426 SNIP 1.141 CiteScore 1.19
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.209 SNIP 0.274 CiteScore 0.58
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.2 SNIP 0.279
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.106 SNIP 0
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.166 SNIP 0
Scopus rating (2007): SJR 0.131 SNIP 0
Web of Science (2007): Indexed yes
Original language: English
DOIs:
10.1243/1748006XJRR48
Updating probability intervals with the beta-Bernoulli model

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy, Systems Analysis Division, Safety, Reliability and Human Factors
Authors: Kozine, I. (Intern)
Pages: 181-187
Publication date: 2007

Host publication information
Title of host publication: Computational models of risks to infrastructure
Place of publication: Amsterdam
Publisher: IOS Press
Editors: Skanata, D., Byrd, D.
ISBN (Print): 978-1-58603-766-6
Main Research Area: Technical/natural sciences
Workshop: NATO Advanced Research Workshop on Computational Models of Risks to Infrastructure, Primosten, Croatia, 09/05/2006 - 09/05/2006
Source: orbit
Source-ID: 216051
Publication: Research - peer-review › Article in proceedings – Annual report year: 2007

On imprecise statistical reasoning

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 301-316
Publication date: 2006

Host publication information
Title of host publication: The way through science and philosophy: Essays in honour of Stig Andur Pedersen
Place of publication: London
Publisher: College Publishers
Editors: Andersen, H., Christiansen, F., Jørgensen, K., Hendricks, V.
ISBN (Print): 1-904987-33-8
Series: Tributes Series, 4
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 309302
Publication: Research › Book chapter – Annual report year: 2006

Simulation of human performance in a discrete event environment

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 355-362
Publication date: 2006

Host publication information
Title of host publication: Safety and reliability for managing risk. Proceedings. Vol. 1
Place of publication: London
Publisher: Taylor and Francis
Uncertainty modelling in probabilistic risk assessment

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 309294
Publication: Research › Conference abstract for conference – Annual report year: 2006

Computing interval-valued reliability characteristics: Where is the stumbling block for applications?

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2005
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 308324
Publication: Research › Conference abstract for conference – Annual report year: 2005

Computing system reliability given interval-valued characteristics of the components

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Utkin, L. (Ekstern), Kozine, I. (Intern)
Pages: 19-34
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Reliable Computing
Volume: 11
ISSN (Print): 1573-1340
Ratings:
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.175 SNIP 0.756 CiteScore 0.5
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.137 SNIP 0.464 CiteScore 0.35
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.204 SNIP 0.42 CiteScore 0.33
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.165 SNIP 0.474 CiteScore 0.38
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Constructing imprecise probability distributions

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 401-408
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: International Journal of General Systems
Volume: 34
ISSN (Print): 0308-1079
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.57 SJR 1.014 SNIP 1.415
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.835 SNIP 1.191 CiteScore 1.73
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.668 SNIP 1.34 CiteScore 1.53
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.484 SNIP 0.957 CiteScore 1.17
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.581 SNIP 1.209 CiteScore 0.93
Modelling human performance in a discrete event simulation environment

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2005

Host publication information
Title of host publication: Proceedings of the man-technology-organisation sessions. Vol. 2
Volume: HPR-365
Main Research Area: Technical/natural sciences
Conference: Enlarged Halden Programme Group meeting, Lillehammer, Norway, 16/10/2005 - 16/10/2005
Source: orbit
Source-ID: 308523
Publication: Research › Article in proceedings – Annual report year: 2005

Optimised and balanced structural and system reliability of offshore wind turbines. An account

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Tarp-Johansen, N. (Intern), Kozine, I. (Intern), Rademakers, L. (Ekstern), Sørensen, J. (Ekstern), Ronold, K. (Ekstern)
Number of pages: 85
Publication date: 2005
A hierarchical uncertainty model, combination rules and uncertainty propagation

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 2511-2516
Publication date: 2004

Host publication information
Title of host publication: Proceedings. Vol. 5
Place of publication: Berlin
Publisher: Springer
Editors: Spitzer, C., Schmocker, U., Dang, V.
Main Research Area: Technical/natural sciences
Conference: 7th International Conference on Probabilistic Safety Assessment and Management, Berlin, Germany, 14/06/2004 - 14/06/2004
Source: orbit
Source-ID: 306951
Publication: Research › Article in proceedings – Annual report year: 2004

An approach to combining unreliable pieces of evidence and their propagation in a system response analysis

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 103-112
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Reliability Engineering & System Safety
Volume: 85
ISSN (Print): 0951-8320
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.78 SJR 1.407 SNIP 2.366
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.373 SNIP 2.403 CiteScore 3.93
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.467 SNIP 2.714 CiteScore 3.4
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.381 SNIP 2.939 CiteScore 3.28
An approach to optimizing the structural reliability and the reliability of the control and safety system of wind turbines

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Tarp-Johansen, N. (Intern), Rademakers, L. (Ekstern)
Pages: 1621-1626
Publication date: 2004

Host publication information
Title of host publication: Proceedings. Vol. 3
Place of publication: Berlin
Publisher: Springer
Editors: Spitzer, C., Schmocker, U., Dang, V.
Conference: 7th International Conference on Probabilistic Safety Assessment and Management, Berlin, Germany, 14/06/2004 - 14/06/2004
Source: orbit
Source-ID: 306952
Publication: Research › Article in proceedings – Annual report year: 2004
Variety of judgements admitted in imprecise statistical reasoning

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 111-120
Publication date: 2003
Main Research Area: Technical/natural sciences

Variety of judgements admitted in imprecise statistical reasoning

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 139-146
Publication date: 2003

Host publication information
Title of host publication: Conference proceedings. Vol. 2
Place of publication: Warszawa
Publisher: Wydawnictwo Instytutu Techniczego Wojsk Lotniczych
Main Research Area: Technical/natural sciences
Conference: 3. Safety and reliability international conference (KONBiN '03), Gdynia (PL), 27-30 May, 01/01/2003
Source: orbit
Source-ID: 305598
Publication: Research - peer-review › Article in proceedings – Annual report year: 2003

Widening the scope of statistical judgements in reliability analysis

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Krymsky, V. (Ekstern)
Pages: 137-148
Publication date: 2003

Host publication information
Title of host publication: Symposium i anvendt statistik
Place of publication: Frederiksberg
Publisher: Den Kgl. Veterinaer- og Landbohøjskole, Institut for Økonomi, Skov og Landskab
Editor: Kærgård, N.
Main Research Area: Technical/natural sciences
Conference: Frederiksberg, Denmark, 27/01/2003 - 27/01/2003
Source: orbit
Source-ID: 305215
Applied advances in imprecise statistical reasoning

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2002
Event: Abstract from Workshop on recent developments in the theory and application of interval probability, Munich (DE), 1 May.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 304635
Publication: Research › Conference abstract for conference – Annual report year: 2002

A reliability model of multi-state units under partial information

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Utkin, L. (Ekstern), Kozine, I. (Intern)
Pages: 643-646
Publication date: 2002
Host publication information
Title of host publication: Communications
Place of publication: Trondheim
Publisher: Norwegian University of Science and Technology
Editors: Langseth, H., Lindquist, B.
Main Research Area: Technical/natural sciences
Conference: 3rd International Conference on Mathematical Methods in Reliability, Trondheim, Norway, 17/06/2002 - 17/06/2002
Source: orbit
Source-ID: 304166
Publication: Research › Article in proceedings – Annual report year: 2002

Assessment of uncertainties in risk analysis of chemical establishments. The ASSURANCE project. Final summary report

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Lauridsen, K. (Intern), Kozine, I. (Intern), Markert, F. (Intern), Amendola, A. (Ekstern), Christou, M. (Ekstern), Fiori, M. (Ekstern)
Number of pages: 49
Publication date: 2002
Publication information
ISBN (Print): 87-550-3063-7
Original language: English
Series: Denmark. Forskningscenter Risoe. Risoe-R
Number: 1344(EN)
ISSN: 0106-2840
Main Research Area: Technical/natural sciences
Risoe-R-1344, Risoe-R-1344(EN)
Electronic versions:
ris_r_1344.pdf
Source: orbit
Source-ID: 304052
Publication: Research › Report – Annual report year: 2002
Fault trees. Fault tree construction Boolean algebra and algebraic operations with probabilities. Cut set representation. Estimating the probability of the top event

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2002
Event: Abstract from Seminar organised in the framework of HU 2001/IB/EN03 (Seveso II. Directive) PHARE twinning project, Tiszaujvaros (HU), 8-26 Apr.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 304605
Publication: Research › Conference abstract for conference – Annual report year: 2002

Interval-valued finite Markov chains

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Publication date: 2002
Event: Abstract from Seminar organised in the framework of HU 2001/IB/EN03 (Seveso II. Directive) PHARE twinning project, Balatonvilagos (HU), 13-31 May
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 304595
Publication: Research › Conference abstract for conference – Annual report year: 2002

Publication information
Journal: Reliable Computing
Volume: 8
ISSN (Print): 1573-1340
Ratings:
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.175 SNIP 0.756 CiteScore 0.5
Processing unreliable judgements with an imprecise hierarchical model

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 1-15
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Risk, Decision and Policy
Volume: 7
Original language: English
Source: orbit
Source-ID: 303863
Publication: Research - peer-review › Journal article – Annual report year: 2002

Stress-strength reliability models under incomplete information

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Utkin, L. (Ekstern), Kozine, I. (Intern)
Structural reliability modelling under partial source information

General information
State: Published
The process of performing a risk analysis, measures of risk (individual risk, societal risk, ways of presenting the risks).

Uncertainties in risk analysis

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2002
Event: Abstract from Seminar organised in the framework of HU 2001/IB/EN03 (Seveso II. Directive) PHARE twinning project, Balatonvilagos (HU), 13-31 May,.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 304592
Publication: Research › Conference abstract for conference – Annual report year: 2002

The process of performing a risk analysis, measures of risk (individual risk, societal risk, ways of presenting the risks).

Uncertainties in risk analysis

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2002
Event: Abstract from Seminar organised in the framework of HU 2001/IB/EN03 (Seveso II. Directive) PHARE twinning project, Tiszaujvaros (HU), 8-26 Apr,.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 304604
Publication: Research › Conference abstract for conference – Annual report year: 2002

The process of performing a risk analysis, measures of risk (individual risk, societal risk, ways of presenting the risks).

Uncertainties in risk analysis

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Publication date: 2002
Event: Abstract from Seminar organised in the framework of HU 2001/IB/EN03 (Seveso II. Directive) PHARE twinning project, Pécel (HU), 17 May - 5 Jun,.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 304679
Publication: Research › Conference abstract for conference – Annual report year: 2002
Computing the reliability of complex systems

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Utkin, L. (Ekstern), Kozine, I. (Intern)
Pages: 324-331
Publication date: 2001

Host publication information
Title of host publication: Proceedings
Place of publication: Maastricht
Publisher: Shaker Publishing
Editors: Cooman, G. D., Fine, T., Seidenfeld, T.
ISBN (Print): 90-423-0130-9
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 302690
Publication: Research - peer-review › Article in proceedings – Annual report year: 2001

Constructing coherent interval statistical models from unreliable judgements

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 173-180
Publication date: 2001

Host publication information
Title of host publication: Safety and reliability. Towards a safer world. Proceedings. Vol. 1
Place of publication: Torino
Publisher: Politecnico di Torino
Editors: Zio, E., Demichel, M., Piccinini, N.
ISBN (Print): 88-8202-099-1
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 302948
Publication: Research › Article in proceedings – Annual report year: 2001

Different faces of the natural extension

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Utkin, L. (Ekstern), Kozine, I. (Intern)
Pages: 316-323
Publication date: 2001

Host publication information
Title of host publication: Proceedings
Place of publication: Maastricht
Publisher: Shaker Publishing
Editors: Cooman, G. D., Fine, T., Seidenfeld, T.
ISBN (Print): 90-423-0130-9
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 302689
Publication: Research - peer-review › Article in proceedings – Annual report year: 2001
Imprecise system reliability

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Filimonov, Y. (Ekstern)
Pages: 487-493
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: International Journal of Systems Science
Volume: 32
ISSN (Print): 0020-7721
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.848 SNIP 1.279 CiteScore 2.33
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.044 SNIP 1.227 CiteScore 2.06
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.027 SNIP 1.375 CiteScore 2.21
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.791 SNIP 1.264 CiteScore 1.9
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.902 SNIP 1.195 CiteScore 1.74
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.791 SNIP 1.211 CiteScore 1.61
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.697 SNIP 0.959
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.615 SNIP 0.958
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.486 SNIP 0.795
Scopus rating (2007): SJR 0.386 SNIP 0.526
Scopus rating (2006): SJR 0.332 SNIP 0.57
Scopus rating (2005): SJR 0.308 SNIP 0.939
Scopus rating (2004): SJR 0.404 SNIP 1.123
Scopus rating (2003): SJR 0.389 SNIP 0.59
Scopus rating (2002): SJR 0.442 SNIP 0.481
Scopus rating (2001): SJR 0.51 SNIP 0.836
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.489 SNIP 0.769
Scopus rating (1999): SJR 0.379 SNIP 0.799
Original language: English
Source: orbit
Safety- and risk analysis activities in chemical industry in Europe

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Duijm, N. (Intern), Lauridsen, K. (Intern)
Pages: 5-12
Publication date: 2001

Host publication information
Title of host publication: Proceedings
Place of publication: Stockholm
Publisher: Swedish Nuclear Power Inspectorate
Editor: Andersson, K.
Main Research Area: Technical/natural sciences
Conference: 2. VALDOR symposium addressing transparency in risk assessment and decision making (VALDOR 2001), Stockholm (SE), 10-14 Jun, 01/01/2001

Safety- and risk analysis activities in other areas than the nuclear industry

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Duijm, N. J. (Intern), Lauridsen, K. (Intern)
Number of pages: 46
Publication date: 2001

Publication information
ISBN (Print): 87-7893-071-5
Original language: English
Series: NKS-21
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 302489
Publication: Research › Report – Annual report year: 2001

Sources and magnitudes of uncertainties in risk analysis of chemical establishments. First insights from an European benchmark study

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Markert, F. (Intern), Kozine, I. (Intern), Lauridsen, K. (Intern), Amendola, A. (Ekstern), Christou, M. (Ekstern)
Pages: 371-384
Publication date: 2001

Host publication information
Title of host publication: Loss prevention and safety promotion in the process industries. Proceedings
Place of publication: Amsterdam
Publisher: Elsevier
Editors: Pasman, H., Fredholm, O., Jacobsson, A.
ISBN (Print): 0-444-50699-3
Main Research Area: Technical/natural sciences
Conference: 10th International symposium, Stockholm, Sweden, 19/06/2001 - 19/06/2001
Source: orbit
The Seveso II directive and Danish activities supporting its application in some Eastern European countries

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Duijm, N. (Intern), Hagen, H. (Ekstern)
Pages: 147-151
Publication date: 2001

Host publication information
Title of host publication: Modelling and analysis of safety, risk and quality in complex systems
Place of publication: Saint-Petersburg
Publisher: Institute of Problems of Mechanical Engineering of Russian Academy of Sciences (IMPE RAS)
ISBN (Print): 5-8220-0043-6
Main Research Area: Technical/natural sciences
Conference: International Scientific School, Saint-Petersburg, Russian Federation, 18/06/2001 - 18/06/2001
Source: orbit
Source-ID: 302687
Publication: Research - peer-review › Article in proceedings – Annual report year: 2001

Uncertainties in risk analysis of chemical establishments - the ASSURANCE project

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Lauridsen, K. (Intern), Amendola, A. (Ekstern), Christou, M. (Ekstern), Markert, F. (Intern), Kozine, I. (Intern)
Publication date: 2001

Host publication information
Title of host publication: Progress in European research on major accident hazards
Place of publication: Antwerp
Publisher: Federal Ministry of Employment and Labour
Main Research Area: Technical/natural sciences
Conference: Seminar, Antwerp (BE), 10 Oct, 01/01/2001
Source: orbit
Source-ID: 302966
Publication: Research › Article in proceedings – Annual report year: 2001

ASSURANCE: Assessment of uncertainties in risk analysis of chemical establishments

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Christou, M. (Ekstern), Lauridsen, K. (Intern), Amendola, A. (Ekstern), Markert, F. (Intern), Kozine, I. (Intern)
Pages: 369-374
Publication date: 2000

Host publication information
Title of host publication: Proceedings. Vol. 1
Place of publication: Tokyo
Publisher: Universal Academy press
Editors: Kondo, S., Furuta, K.
ISBN (Print): 4-946443-64-9
Series: Frontiers Science Series
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 301738
Publication: Research - peer-review › Article in proceedings – Annual report year: 2000

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 831-837
Publication date: 2000
Main Research Area: Technical/natural sciences

Publication information
Journal: International Journal of General Systems
Volume: 29
ISSN (Print): 0308-1079
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.57 SJR 1.014 SNIP 1.415
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.835 SNIP 1.191 CiteScore 1.73
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.668 SNIP 1.34 CiteScore 1.53
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.484 SNIP 0.957 CiteScore 1.17
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.581 SNIP 1.209 CiteScore 0.93
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.481 SNIP 1.003 CiteScore 0.92
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.31 SNIP 0.932
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.445 SNIP 0.961
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.592 SNIP 0.941
Scopus rating (2007): SJR 0.544 SNIP 0.79
Scopus rating (2006): SJR 0.695 SNIP 0.973
Scopus rating (2005): SJR 0.532 SNIP 0.859
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.286 SNIP 0.784
Scopus rating (2003): SJR 0.243 SNIP 0.656
Scopus rating (2002): SJR 0.49 SNIP 0.596
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.331 SNIP 0.541
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.261 SNIP 0.386
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.302 SNIP 0.84
Original language: English
Source: orbit
Conditional previsions in imprecise reliability

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Utkin, L. (Ekstern), Kozine, I. (Intern)
Pages: 72-79
Publication date: 2000

Host publication information
Title of host publication: Intelligent techniques and soft computing in nuclear science and engineering. Proceedings
Place of publication: Singapore
Publisher: World Scientific Publishing Co Pte Ltd
Editors: Ruan, D., Abderrahim, H., D'hondt, P.
ISBN (Print): 981-02-4356-1
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 301342

Failure database and tools for wind turbine availability and reliability analyses. The application of reliability data for selected wind turbines

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Christensen, P. (Ekstern), Winther-Jensen, M. (Ekstern)
Number of pages: 47
Publication date: 2000

Publication information
ISBN (Print): 87-550-2732-6
Original language: English
Series: Denmark. Forskningscenter Risoe. Risoe-R
Number: 1200(EN)
ISSN: 0106-2840
Main Research Area: Technical/natural sciences
Risoe-R-1200, Risoe-R-1200(EN)
Electronic versions:
ris_r_1200.pdf
Source: orbit
Source-ID: 301284
Publication: Research › Report – Annual report year: 2000

Generalizing Markov chains to imprecise previsions

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Utkin, L. (Ekstern)
Pages: 383-388
Publication date: 2000

Host publication information
Title of host publication: Proceedings. Vol. 1
Place of publication: Tokyo
Publisher: Universal Academy press
Editors: Kondo, S., Furuta, K.
ISBN (Print): 4-946443-64-9
Imprecise discrete Markov chains

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 638-641
Publication date: 2000

Host publication information
Title of host publication: Abstracts' book. Vol. 2
Place of publication: Bordeaux
Publisher: Université Victor Segalen
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 301100
Publication: Research › Conference abstract in proceedings – Annual report year: 2000

Imprecise reliabilities: Experiences and advances

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Filimonov, Y. (Ekstern)
Pages: 75-83
Publication date: 2000

Publication information
Journal: Reliability Engineering & System Safety
Volume: 67
ISSN (Print): 0951-8320
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.78 SJR 1.407 SNIP 2.366
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.373 SNIP 2.403 CiteScore 3.93
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.467 SNIP 2.714 CiteScore 3.4
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.381 SNIP 2.939 CiteScore 3.28
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.566 SNIP 3.008 CiteScore 3.55
ISI indexed (2012): ISI indexed yes
Constructing imprecise probabilities on failure data

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Filimonov, E. (Ekstern)
Pages: 1125-1130
Publication date: 1999

Host publication information
Title of host publication: Safety and reliability. Proceedings. Vol. 2
Place of publication: Rotterdam
Publisher: Balkema Publishers, A.A. / Taylor & Francis The Netherlands
Editors: Schuëller, G., Kafka, P.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 299963
Publication: Research › Article in proceedings – Annual report year: 1999

Imprecise probabilities relating to prior reliability assessments

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 241-248
Publication date: 1999
Analogical reasoning for reliability analysis based on generic data

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern)
Pages: 59-64
Publication date: 1996
Main Research Area: Technical/natural sciences

Publication information
Journal: Reliability Engineering & System Safety
Volume: 54
ISSN (Print): 0951-8320
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.78 SJR 1.407 SNIP 2.366
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.373 SNIP 2.403 CiteScore 3.93
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.467 SNIP 2.714 CiteScore 3.4
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.381 SNIP 2.939 CiteScore 3.28
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.566 SNIP 3.008 CiteScore 3.55
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.825 SNIP 2.945 CiteScore 3.15
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.268 SNIP 2.345
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.198 SNIP 2.634
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.95 SNIP 2.313
Developing a data base for supporting decision making on wind turbine performance

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kozine, I. (Intern), Christensen, P. (Intern), Kongso, H. (Ekstern)
Publication date: 1996

Host publication information
Title of host publication: Rotating machinery performance
Place of publication: Chamonix
Publisher: ESReDA, Electricité de France
Main Research Area: Technical/natural sciences
Conference: 10. ESReDA seminar, Chamonix (FR), 4-5 Apr, 01/01/1996
Source: orbit
Source-ID: 295702
Publication: Research › Article in proceedings – Annual report year: 1996

The EFP-94 project on safety systems for wind turbines. Method for evaluation of failure modes and reliability. Appendix 3: Database objects

General information
State: Published
Organisations: Risø National Laboratory for Sustainable Energy
Authors: Kongso, H. E. (Intern), Kozine, I. (Intern), Christensen, P. (Intern)
Number of pages: 16
Publication date: 1996

Publication information
ISBN (Print): 87-550-2210-3
Original language: English

Series: Denmark. Forskningscenter Risoe. Risoe-R
Number: Risø-R-915(App.3)(EN)
ISSN: 0106-2840
Main Research Area: Technical/natural sciences
Ris-R-915, Risø-R-915(App.3)(EN), Risø-R-915(EN)
Electronic versions:
RIS_R_915_app3.pdf
Source: orbit
Source-ID: 295167
Publication: Research › Report – Annual report year: 1996
Projects:

Identification of Safety and Security Cascading Risks in Cyber-Physical Systems
Department of Management Engineering
Period: 01/11/2017 → 31/10/2020
Number of participants: 4
Phd Student: Carreras Guzman, Nelson Humberto (Intern)
Supervisor: Lundteigen, Mary Ann (Ekstern)
Taylor, John (Ekstern)
Main Supervisor: Kozin, Igor (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Visual communication design for decision making during emergency situations
Department of Management Engineering
Period: 01/12/2015 → 30/11/2018
Number of participants: 4
Phd Student: Andersen, Emil (Intern)
Supervisor: Kozin, Igor (Intern)
Strand, Stine (Ekstern)
Main Supervisor: Maier, Anja (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Assessing the Capabilities of Advanced Risk Methods for Engineering Systems Management
Department of Management Engineering
Period: 01/02/2015 → 31/01/2018
Number of participants: 3
Phd Student: Tegeltija, Miroslava (Intern)
Supervisor: Kozin, Igor (Intern)
Main Supervisor: Oehmen, Josef (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

OPHRA - Offshore Platform Hydrocarbon Risk Analysis – Feasibility study
The purpose of the project is to demonstrate the feasibility of developing a tool to assess the risk on offshore platforms due to releases of hydrocarbons. This risk is to be understood as the risk to personnel, expressed in terms of Individual Fatality Risk (IR), Potential Loss of Life (PLL), Fatal Accident Rate (FAR, at platform and workplace level), and group risk (distribution of number of simultaneous fatalities).
The tool will be based on simulation of the interaction between concurrent phenomena following loss of containment, specifically:

- The physical processes (outflow, dispersion, ignition, heat radiation, explosion)
- Detection, alarming and emergency shutdown
- Escape and evacuation
- Impact on persons, escalation and impairment of safety functions

The interaction between these event trees depend on the stochastic outcome of times needed from one event to the other, this set of event trees will be referred to as the dynamic event trees. The simulation technique will be based on Discrete Event Simulation.

The tool will provide an overall framework to describe and simulate the interactions between the above mentioned concurrent chains of events. The final tool is intended to offer a platform for offshore QRA offering flexibility in choosing data and models to describe these single events.

Focus will be on the documentation of the input that users will use to apply the tool, i.e. the data and models to describe the events in the simulation. The QRA process is considered as combining two sets of knowledge:

1) Assumptions – this consists of the majority of the input to the QRA, such as failure data of components, consequence models, expected responses from systems and people, ambient conditions, the interaction between physical lay-out and impacts, and many other simplifications of reality;

2) Probabilistic reasoning – this consists of the logic reasoning that generates all possible combinations of events in the dynamic event trees– according to the assumptions – into final outcomes.

In principle the probabilistic reasoning will include some level of assumption (viz. a limited number of events in the dynamic event trees), but the ideas is that the principle of the probabilistic reasoning can be justified and verified (i.e. it is possible to ensure that a set of input correctly leads to some output) independent of the correctness of the assumptions, so this part can be verified “once and for all”, while the other input, the assumptions, is presented completely and transparently, so that these assumptions can be verified or justified for each study (or consequence models can be verified or validated independently).

The feasibility study will include the following activities:

The probabilistic reasoning: Establishment of event trees

Generic event trees will be developed for the 4 concurrent processes, and links defined between these processes. The event trees will be expressed with “time from release” as the independent variable. The development of the processes will all be expressed with reference to this time.

For demonstration purposes the event tree framework will be implemented in ARENA® Discrete Event Simulation (DES) software. ARENA will allow single simulations to be visualized for verification and testing. The ARENA implementation will be demonstrated to the project partners and its review group. The ARENA implementation is not intended for release to other parties.

Rules for input and documentation

Formal requirements for initial data (information on the platform layout, modules, escape routes, etc.) and the deterministic (for describing physical effects) and stochastic (for describing random events) models contained in the "event boxes" will be established, i.e. dependent parameters and the output of each model will be defined. For example, the model for "jet flame" will depend on release rate, hole size, direction, and deliver as output: flame size, location and radiation contour.

Input can be provided either by on-line models, which, for the sake of creating statistical significant results, need to be very simple, or off-line data, such as results from CFD explosion modeling, which requires some processing and interpolation of results in order to transfer results from few scenarios into the DES model.

An important consideration will be to develop criteria or a format for documentation of the assumptions with respect to completeness, transparency and traceability.

For the feasibility study, very simple models for the events will be selected, mainly based on the "Yellow Book" or other similar, relevant sources. Only models necessary to create sufficient credibility of the feasibility study will be included, which e.g. means that the easiest type of release (single phase gas release) will be included.

DTU will deliver to the project partners by the end of the feasibility study:

- A proposal for transparent and complete documentation of QRA assumptions (input), to be delivered by means of a technical report describing structure, and exemplification using the demo case study;
- A description of a framework for a QRA technique based on concurrent (dynamic) event trees, evaluated using Discrete Event Simulation, to be delivered by mean of a technical report;
- A demonstration of that framework with a simple set of models and data, to be delivered as a workshop demonstration and output by means of screen dumps with explanatory text.

Department of Management Engineering

Production and Service Management

DONG Energy A/S

Period: 01/12/2012 → 30/06/2013

Number of participants: 3

Risk Analysis, Oil and Gas, Offshore, Discrete-Event Simulation

Acronym: OPHRA

Project participant:

Duijm, Nijs Jan (Intern)
Kozin, Igor (Intern)
Markert, Frank (Intern)

Relations
Activities:
A novel risk assessment method using dynamic simulation of fire and egress scenarios on off-shore platforms

Allocation of quantitative safety targets to the railway sector infrastructure

Department of Management Engineering
Period: 01/04/2012 → 31/03/2013
Number of participants: 4
Phd Student:
Khaliq, Abdul (Intern)
Supervisor:
Duijm, Nijs Jan (Intern)
Funch, Leif (Ekstern)
Main Supervisor:
Kozin, Igor (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Safe manning simulation tool
The aim of this Danish research project is to develop a simulation tool for estimating the resources needed for manoeuvring commercials vessels.

Department of Management Engineering
Safety, Reliability and Human Factors
Safety, Reliability and Human Factors
Production and Service Management
FORCE Technology

Søfartsstyrelsen
Period: 01/02/2008 → 30/09/2009
Number of participants: 3
Simulation, Ship, Staffing, Manning, Discrete-Event Simulation, Safety
Acronym: Safe Manning
Project ID: 81009
Project participant:
Alapetite, Alexandre (Intern)
Weber, Steen (Intern)
Project Manager, academic:
Kozin, Igor (Intern)

Financing sources
Source: Private funding (private)
Name of research programme: Den Danske Maritime Fond
Web address: http://www.dendanskemaritimefond.dk/
Year of approval: 2008

Relations
Publications:
SafeManning
Press / Media items:
Dynamo: Kursen er sat mod sikker bemanding

Project
Traceability of Layout Design of Agricultural Machinery

Department of Management Engineering
Period: 01/09/2007 → 25/06/2013
Number of participants: 7
PhD Student:
Marini, Vinicius Kaster (Intern)
Supervisor:
Kozin, Igor (Intern)
Markert, Frank (Intern)
Main Supervisor:
Ahmed-Kristensen, Saeema (Intern)
Examiner:
Edwards, Kasper (Intern)
McMahon, Christopher Alan (Ekstern)
Miller, Thomas Dedenroth (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Activities:

ACCIDENT MANAGEMENT AND OPERATION
Period: 21 May 2015
Igor Kozin (Participant)
Department of Management Engineering
Production and Service Management
Engineering Systems Group
Risk Research Group

Description
Contributed to making up a research agenda for the Halden Reactor Project

It was the Halden Reactor Project workshop "ACCIDENT MANAGEMENT AND OPERATION" held on 20-21 May in Halden, Norway.

Related event

ACCIDENT MANAGEMENT AND OPERATION
20/05/2015 → 21/05/2015
Halden, Norway
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.